PORTABLE PURIFYING SYSTEM

The present application is related to prior provisional application Serial Number 60/447,790, filed 02/14/03, entitled "PORTABLE PURIFYING SYSTEM", from which priority is claimed, the contents of which are incorporated herein by this reference and are not admitted to be prior art with respect to the present invention by the mention in this cross-reference section.

BACKGROUND

This invention relates to providing a purifying system for purifying cleaning solutions such as solvents being used for washing oily components, particularly those used in parts washers (such as auto parts washers). Solvents for parts washers typically include petroleum distillate solvents or aqueous cleaning solvents. This invention relates most generally to aqueous cleaning solvents; however, it may be useful with petroleum distillate solvents as well.

Typically, parts washers are used to clean parts that are dirty and remove waste products such as hydrocarbons, oils and metallic shavings. Parts washers typically have a basin with an attached hose (one or more) for dispensing the cleaning solvent onto the parts. The parts are typically placed in the basin and the cleaning solvent poured over the parts while being washed (washing includes scrubbing, brushing and soaking). The unwanted material from the parts is washed down a drain in the basin, most

typically back into a reservoir below or adjacent the basin. Typically, the cleaning solvent is pumped from a large reservoir beneath the basin such that the cleaning solvent is re-circulated. Again, as the parts are washed, a great deal of waste is removed from the parts such as dirt, metals and assorted oils. These sediments and oils are mixed with the cleaning solvent and eventually degrade the cleaning solvent, thereby reducing its effectiveness such that it must be replaced. Such cleaning solvents are costly both to purchase when new and to dispose of when old (as they are generally considered to be hazardous materials, especially when used).

Furthermore, there are often metals and other such debris in the solvent that are undesirable and may even damage the re-circulating pump, typically located near the bottom of the reservoir. It would be advantageous to have a purifying system that would prolong the life of the solvent. It would also be advantageous to have a purifying system that would better protect the pump mechanism. It would also be advantageous to provide a means for removing oils from the solvent thereby increasing the useful life of the solvent.

OBJECTS OF THE INVENTION

A primary object and feature of the present invention is to provide a purifying system for purifying the solvent and filtering out oils and debris such that the life of the solvent

would be prolonged.

It is a further object and feature of the present invention to provide such a system that is portable and easily cleaned.

It is a further object and feature of the present invention to provide such a system that reduces the amount of hazardous waste generated by current parts washers.

A further primary object and feature of the present invention is to provide such a system that is efficient, inexpensive, and handy. Other objects and features of this invention will become apparent with reference to the following descriptions.

SUMMARY OF THE INVENTION

In accordance with a preferred embodiment hereof, this invention provides a portable purifying system comprising, in combination: first reservoir means, comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall for collecting, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material; gravity means for using gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired

material; retrieving means for retrieving, from at least one selected location in such at least one first reservoir means, a higher ratio of the at least one desired material; and outlet means for providing an outlet spill outside such first reservoir means; wherein such retrieving means comprises debris separating means for separating debris from the at least one desired material; wherein such first configuration of such first reservoir means comprises such gravity means; and wherein such retrieving means comprises substantially vertical cylinder means for forming at least one passageway from the at least one selected location to such outlet means, such outlet means being at least as high as at least one location adjacent such upper rim portion of such first reservoir means.

Moreover, it provides such a purifying system further comprising: second reservoir means for holding essentially the at least one desired material; wherein such first reservoir means is removably situate within such second reservoir means. Additionally, it provides such a purifying system wherein such retrieving means comprises filtering means restricting passage of the at least one such undesired material. Also, it provides such a purifying system wherein such first reservoir means is portable. In addition, it provides such a purifying system further comprising at least one support means for supporting such first reservoir means within such second reservoir means. And,

it provides such a purifying system wherein such first reservoir means is removably attached to at least one washbasin. Further, it provides such a purifying system wherein such filtering means comprises polypropylene means for filtering oils from at least one such desired material.

In accordance with another preferred embodiment hereof, this invention provides in combination: at least one first reservoir, comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall, adapted to collect, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material; at least one gravity separator to use gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired material; at least one retriever to retrieve from at least one selected location in such at least one first reservoir, a higher ratio of the at least one desired material; and at least one outlet adapted to provide at least one outlet spill outside such at least one first reservoir; wherein such retriever comprises at least one debris separator to separate debris from the at least one desired material; wherein such first configuration of such at least one first reservoir comprises such at least one gravity separator; and wherein such

at least one retriever comprises at least one substantially vertical cylinder to form at least one passageway from the at least one selected location to such at least one outlet, such at least one outlet being at least as high as at least one location adjacent such upper rim portion of such at least one first reservoir.

Even further, it provides such a purifying system further comprising: at least one second reservoir structured and arranged to hold essentially the at least one desired material; wherein such at least one first reservoir is removably situate within such at least one second reservoir. Moreover, it provides such a purifying system wherein such at least one retriever comprises at least one filter restricting passage of the at least one such undesired material. Additionally, it provides such a purifying system wherein such first reservoir is portable. Also, it provides such a purifying system further comprising at least one support adapted to support such at least one first reservoir within such at least one second reservoir. In addition, it provides such a purifying system wherein such first reservoir means is removably attached to at least one washbasin. And, it provides such a purifying system wherein such at least one filter comprises polypropylene structured and arranged to filter oils from the at least one such desired material. It also provides at least one first O-ring adapted to removably couple such at least

one oil-blocking filter to such at least one inlet. And, it provides at least one second O-ring adapted to provide at least one seal between such at least one outlet portion and such at least one sidewall of such at least one reservoir.

In accordance with another preferred embodiment hereof, this invention provides a portable purifying system comprising, in combination: at least one portable reservoir comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall, adapted to collect, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material; at least one vertical cylinder, having at least one inlet portion to retrieve from at least one selected location in such at least one portable reservoir, a higher ratio of the at least one desired material, and at least one outlet portion adapted to provide at least one outlet spill outside such at least one first reservoir; wherein such at least one vertical cylinder is attached to such at least one reservoir such that such at least one inlet portion draws from at least one selected location within such at least one reservoir and such at least one outlet portion outlets through such at least one side wall outside of such at least one reservoir; and wherein such first configuration of such at least one reservoir comprises at least one gravity separator to use

gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired material.

Further, it provides such a purifying system further comprising at least one oil-blocking filter removably covering such at least one inlet. Even further, it provides such a purifying system further comprising at least one magnetic attractor located within or closely adjacent such at least one reservoir. Even further, it provides such a purifying system wherein such at least one magnetic attractor is located near at least one bottom portion of such at least one reservoir. Even further, it provides such a purifying system wherein such at least one reservoir has a fluid capacity of about five gallons. Even further, it provides such a purifying system wherein such at least one reservoir comprises one 5-gallon bucket.

Even further, it provides such a purifying system wherein such at least one vertical cylinder comprises PVC pipe. Even further, it provides such a purifying system further comprising at least one washbasin. Even further, it provides such a purifying system further comprising: at least one support, having at least one circumferential band and at least three support legs attached to such at least one circumferential band; wherein such at least one reservoir is removably supported by such at least one support. Even further, it provides such a purifying system

wherein such at least three support legs comprise PVC pipe. Even further, it provides such a purifying system further comprising at least one height adjuster structured and arranged to adjust the height of such at least one support.

In accordance with another preferred embodiment hereof, this invention provides a portable purifying system comprising, in combination, the steps of: means for providing a smaller reservoir within a larger reservoir; means for using re-circulating solvent from the larger reservoir, washing oily parts in such manner that oily residue from the washed parts is deposited in the smaller reservoir; means within the smaller reservoir, for separating cleaner portions of solvent from dirtier portions of solvent; means for moving the cleaner portions of solvent into the larger reservoir; and means for periodically emptying and cleaning the smaller reservoir. Even further, it provides such a purifying system wherein the step of separating comprises the step of: means for using density differences to separate by gravity action cleaner portions from dirtier portions.

In accordance with another preferred embodiment hereof, this invention provides a portable purifying system comprising, in combination, the steps of: providing a smaller reservoir within a larger reservoir; using re-circulating solvent from the larger reservoir, washing oily parts in such manner that oily residue

from the washed parts is deposited in the smaller reservoir; within the smaller reservoir, separating cleaner portions of solvent from dirtier portions of solvent; moving the cleaner portions of solvent into the larger reservoir; and periodically emptying and cleaning the smaller reservoir. It also provides such a system wherein the step of separating comprises the step of: using density differences to separate by gravity action cleaner portions from dirtier portions.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of the portable purifying system installed in a parts washer according to a preferred embodiment of the present invention.

FIG. 2 shows a perspective view of the portable purifying system of FIG. 1.

FIG. 3 shows a sectional view through section 3-3 of FIG. 1.

FIG. 4 shows an exploded perspective view of the reservoir of the portable purifying system of FIG. 2.

FIG. 5 shows a perspective view of a magnetic attractor of the portable purifying system of FIG. 3.

FIG. 6 shows a detail view of detail 6-6 of FIG. 3.

FIG. 7 shows an exploded perspective view of the support stand of the portable purifying system of FIG. 1.

FIG. 8 shows a sectional view through section 8-8 of FIG. 7.

FIG. 9 shows an exploded perspective view of another

embodiment of the reservoir of FIG. 4.

FIG. 10 shows a section view through an assembled vertical cylinder of the reservoir of FIG. 9.

FIG. 11 shows a perspective view of the support stand of the portable purifying system according to another preferred embodiment of the present invention.

FIG. 12 shows a front view of a first panel of the support stand of FIG. 11.

FIG. 13 shows a front view of a second panel of the support stand of FIG. 11.

DETAILED DESCRIPTION OF BEST MODES AND PREFERRED EMBODIMENTS OF THE INVENTION

FIG. 1 is a perspective view of the portable purifying system **100** installed in a parts washer **102** according to a preferred embodiment of the present invention. FIG. 2 is a perspective view of the portable purifying system **100** of FIG. 1. FIG. 3 is a sectional view through section 3-3 of FIG. 1.

Preferably, the portable purifying system **100** comprises a reservoir assembly **104** and a support stand **106**, as shown. Preferably, the portable purifying system **100** is utilized within a parts washer **102**, as shown. Such parts washers **102** are preferable for use of the portable purifying system **100** and commonly comprise a reservoir **108** (at least embodying herein at least one second reservoir structured and arranged to hold

essentially the at least one desired material, and at least embodying second reservoir means for holding essentially the at least one desired material) that further comprises a pump **110** and heating element **112**, as shown. Furthermore, the parts washer **102** preferably comprises a washbasin **114**, as shown. Preferably, the washbasin comprises a wash pan **116**, having a drain **118** and a cover **120**. Preferably, at least one nozzle assembly **122** is also provided, as shown. Preferably, the nozzle assembly **122** comprises a flexible conduit **124** having a nozzle end **126** and a supply conduit **128** attached to the pump **110** to draw cleaning fluid **130** (herein referred to as solvent **130**) from within the reservoir **108**, as shown.

As described above, the parts washer typically operates as follows: a part **132** is placed in washbasin **114**; the parts washer circulating pump **110** is started as well as heater **128** (heat is used to increase the efficiency of the solvent in removing petroleum products such as grease and oil); the solvent is pumped to nozzle **126** and over and around part **132** (a brush may also be used at this time to scrub the part); the now "dirty" solvent **130** gravitates toward the drain **118** and, in prior art, flows into the reservoir **108**. In a preferred embodiment of the present invention, the "dirty" solvent **130** gravitates toward the drain **118** but flows into the portable purifying system **100**, as shown.

Preferably, the reservoir assembly **104** comprises a reservoir **140**, preferably comprising a diameter (width) and depth preferably sized about equal to a 5-gallon plastic bucket (at least embodying herein wherein such at least one reservoir comprises one 5-gallon bucket), preferably rounded, as shown (this arrangement at least embodies herein first reservoir means, comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall for collecting, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material; and, it at least embodies herein at least one first reservoir, comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall, adapted to collect, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material). Preferably, reservoir **140** is portable such that it may be lifted by a person without the assistance of another person (at least embodying herein wherein such first reservoir is portable; and at least embodying herein wherein such first reservoir means is portable). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering

such issues as economics, user preference, etc., other means for portability, such as placing wheels along the bottom of the reservoir, using assistance to transfer the reservoir, etc., may suffice.

Such 5-gallon buckets are preferably high-density polyethylene (HDPE) (such as available from US Plastics Corporation www.usplastic.com 1390 Neubrecht Rd. Lima, Ohio 45801-3196; 1-800-809-4217) and may be hot-filled up to 190°F, steam sterilized or frozen. Preferably, all pails have a sturdy wire bail **136** with a plastic handgrip **138**. Standard bucket measurements are about eleven and three-quarters inches in diameter at the top opening by about fourteen and one-eight inches high by about ten and three-eighths inches in diameter at the closed bottom of the bucket (this arrangement facilitates bucket stacking for easier storing of the buckets). The bucket wall thickness typically ranges from about one-eighth inch to about one-fourth inch. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, etc., other reservoir arrangements, such as functionally being able to provide a reservoir for gravity separation of the differing densities of material in the dirty solvent, etc., may suffice. For example, parts washers range in size and shape such that the capacity and

shape of the reservoir **140** may also be altered without detracting from the intended function. In light of the teachings herein, those knowledgeable in such art may determine other such capacities and shapes for the reservoir **140**. For example, a typical parts washer having a 15-35 gallon capacity may preferably use a 5-gallon reservoir (at least embodying herein wherein such at least one reservoir has a fluid capacity of about five gallons); however a parts washer having a smaller or larger capacity might preferably have a respectively smaller or larger capacity reservoir **140**. Furthermore, such reservoir **140** needs to provide a deep enough reservoir to accommodate the gravitational separating of the cleaner solvent **130** from the dirty solvent (this arrangement at least embodies herein wherein such first configuration of such first reservoir means comprises such gravity means; and at least embodies herein wherein such first configuration of such at least one first reservoir comprises such at least one gravity separator). Preferably, the reservoir **140** comprises one-third to one-seventh of the total volume of the solvent **130** being used in the parts washer. A "smaller" reservoir **140** may lead to the portable purifying system **100** having to be "cleaned" more often. Such cleaning process will be further detailed below.

Reference is now made to FIG. 4 in addition to continued reference to the above Figures. FIG. 4 is an exploded

perspective view of the reservoir of the portable purifying system of FIG. 2. Preferably, the reservoir assembly **104** further comprises two vertical cylinders **142**, as shown (at least embodying herein retrieving means for retrieving, from at least one selected location in such at least one first reservoir means, a higher ratio of the at least one desired material; and at least embodying herein at least one retriever to retrieve from at least one selected location in such at least one first reservoir, a higher ratio of the at least one desired material). Most preferably, the vertical cylinders **142** are comprised of plastic, preferably a plastic that will not react with the solvent, most preferably polyvinyl chloride pipe (herein referred to as simply PVC pipe, most preferably, schedule 40 or above), as shown; however, under appropriate circumstances, other materials may suffice (the above arrangement at least embodies herein wherein such at least one vertical cylinder comprises PVC pipe). For example, in light of the teachings herein, those knowledgeable in such materials art may, under appropriate circumstances choose other materials that would suffice, such as, for example, high density polyethylene (herein referred to as HDPE), stainless steel, etc.

Preferably, the vertical cylinders **142** comprise a minimum inner diameter **143** of about one-inch (outlet portion shown is preferably one and one-quarter inch inner diameter to accommodate

inlet portion **146**, as shown). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, material availability, durability, etc., other inner diameters **143**, may suffice. For example, the pipe inner diameter **143** must provide for a volume of solvent **130** to flow through the combined diameters of the vertical cylinders **142** at least equal to, or greater than, the pump **128** flow which is draining into the reservoir **140** or the reservoir **140** will overflow (such operation is further explained below). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, reservoir volume, bleed off preferences (if desired), etc., other parameters for determining the inner diameters **143**, may suffice.

Preferably, each vertical cylinder **142** comprises an outlet portion **144** (at least embodying herein at least one outlet portion adapted to provide at least one outlet spill outside such at least one first reservoir), an inlet portion **146** (at least embodying herein at least one vertical cylinder, having at least one inlet portion to retrieve from at least one selected location in such at least one portable reservoir, a higher ratio of the at least one desired material), a filter **148** (at least embodying

herein wherein such retrieving means comprises debris separating means for separating debris from the at least one desired material; and at least embodying herein wherein such retriever comprises at least one debris separator to separate debris from the at least one desired material) and a filter retainer **150**, as shown. Preferably, the outlet portion **144** comprises a T-portion **152**, preferably a PVC pipe T-fitting having about a 90-degree T-portion **152**, as shown. Preferably, each of the above components (outlet portion **144**, inlet portion **146**, filter **148** and filter retainer **150**) are then assembled and connected as herein described/shown.

Preferably, as best illustrated in FIG. 4, the outlet portion **152** inserts into an aperture **154** located along the top portion **156** of the reservoir **104**, preferably about two and one-half inches from the top edge **158** of the reservoir **140** to the center of the outlet opening **160** such that the outlet opening **160** spills outside of the reservoir **140** (at least embodying herein outlet means for providing an outlet spill outside such first reservoir means; and at least embodying herein at least one outlet adapted to provide at least one outlet spill outside such at least one first reservoir), as shown. The above-described arrangement at least embodies herein wherein such retrieving means comprises substantially vertical cylinder means for forming at least one passageway from the at least one selected location

to such outlet means, such outlet means being at least as high as at least one location adjacent such upper rim portion of such first reservoir means; and at least embodies herein wherein such at least one retriever comprises at least one substantially vertical cylinder to form at least one passageway from the at least one selected location to such at least one outlet, such at least one outlet being at least as high as at least one location adjacent such upper rim portion of such at least one first reservoir; and also at least embodies herein wherein such at least one vertical cylinder is attached to such at least one reservoir such that such at least one inlet portion draws from at least one selected location within such at least one reservoir and such at least one outlet portion outlets through such at least one side wall outside of such at least one reservoir.

Preferably, the outlet portion **152** is comprised of one-and one-quarter-inch inner-diameter pipe, preferably PVC pipe as described above, preferably about three and one-half inches in length, such that the inlet portion **146** will tightly and preferably "telescopically" fit into the outlet portion **152**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, material availability, size, etc., other dimensions and arrangements may suffice. Preferably, the outlet

portion **152** is attached to the reservoir **140**, preferably by use of a cable tie **162**, as shown. Preferably the cable tie is made from heat-stabilized nylon and is weather (ultra-violet) resistant (for example, such as available from Talco Specialties www.talcospecialties.com). Preferably, a cable tie **162** is inserted through first aperture **164** and wrapped around the outlet portion **152** then inserted through the second aperture **166** then pulled tightly and clasped, as shown (see FIG. 2). Preferably, sealant **168** is then applied between the outlet opening **160** and the aperture **154**. Preferably, the sealant **168** is allowed to dry, forming a permanent seal such that the aperture **154** is sealed and the outlet portion **152** is held to the reservoir **140** both by the cable tie **162** and sealant **168**, as shown. Preferably, the sealant **168** is silicone, preferably clear (such as made by GE Silicone www.gesealants.com). Silicone provides a sealant that is water repellent, chemically inert and stable at extreme temperatures.

FIG. 9 shows an exploded perspective view of another embodiment of the reservoir of FIG. 4. FIG. 10 shows a section view through an assembled vertical cylinder of the reservoir of FIG. 9. In another preferred embodiment shown in FIG. 9 and FIG. 10, an O-ring **230**, preferably having an inner diameter just large enough to fit over the outlet portion **152** (one and one-quarter inch inner diameter pipe in the above described preferred

embodiment of FIG. 1) and preferably resistant to the solvent in the reservoir **104** for example, preferably neoprene. Preferably, the O-ring **230** is used to seal the outlet opening **160** and the aperture **154**, as shown (at least embodying herein at least one second O-ring adapted to provide at least one seal between said at least one outlet portion and said at least one side wall of said at least one reservoir). Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, etc., other sealing arrangements to seal the outlet opening **160** and the aperture **154** may suffice.

Preferably, in the described embodiment, the inlet portion **146** comprises one-inch-inner-diameter pipe, preferably PVC pipe as described above, preferably about six and one-half inches in length. Preferably, the inlet portion **146** comprises one flat-cut end **170** perpendicular to a longitudinal axis of the inlet portion **146**, as shown. Preferably, the inlet portion **146** comprises one forty-five-degree cut end **172** that is angled at a forty-five degree angle to a longitudinal axis of the inlet portion **146**, as shown. Under appropriate circumstances, other arrangements may suffice. In light of the teachings herein, those knowledgeable in such art may choose to increase or decrease the cut angles, provided their function is maintained. Applicant has found the

approximate preferred angles to be well-suited for multiple functions (for example, ease of solvent flow through the pipe, ease of assembly-disassembly with other components, increased filter surface area, lighter oil flow along the filter media and minimal blockage (as the solvent is circulated).

It is noted that the above-described reservoir **140** at least embodies herein at least one portable reservoir comprising a first configuration, at least one upper rim portion, at least one open top portion, and at least one side wall, adapted to collect, through such at least one open top, at least one mixture comprising a first ratio of at least one desired material and at least one second ratio of at least one undesired material.

Preferably, the flat-cut end **170** will tightly, slidably insert into the bottom end **174** of the outlet portion **152**, as shown. Preferably, a filter **148** and a filter retainer **150** are connected to the forty-five-degree cut-end **172**, as shown.

Preferably, the filter **148** is an "oil only" polypropylene filter (such as available from Kleentec; www.Kleetec.com). This arrangement at least embodies herein at least one filter comprising polypropylene structured and arranged to filter oils from the at least one such desired material. This arrangement also at least embodies herein wherein such filtering means comprises polypropylene means for filtering oils from at least one such desired material. Preferably, the filter **148** stops oil

and larger particles from entering the inlet portion **146** (at least embodying herein at least one oil-blocking filter removably covering such at least one inlet). Preferably, the filter **148** is placed over the forty-five-degree cut end **172** and the filter retainer **150** is placed over the filter **148** and then slidably pushed onto and over both the filter and the forty-five-degree cut end **172** of the inlet portion **146**, as shown. Preferably, the filter retainer **150** comprises one flat-cut end **176** perpendicular to a longitudinal axis of the filter retainer **150** and one forty-five-degree cut-end **178** that is angled at a forty-five degree angle to a longitudinal axis of the filter retainer **150**, as shown. Preferably, the forty-five-degree cut end **178** is aligned and matched in shape to the forty-five-degree cut end **172**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, viscosity of the solvent, etc., other cut-end **172** and **178** arrangements, such as more or less than forty-five-degrees, etc., may suffice.

In an alternate preferred embodiment, shown in FIG. 9 and FIG. 10, an O-ring **234** is used to hold filter **148** in lieu of filter retainer **150**, as shown (at least embodying herein at least one first O-ring adapted to removably couple said at least one

oil-blocking filter to said at least one inlet). Preferably, the filter **148** is placed over the forty-five-degree cut end **172** and the filter retainer **150** is placed over the filter **148** and then slidably pushed onto and over both the filter and the forty-five-degree cut end **172** of the inlet portion **146**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, etc., other filter retaining arrangements may suffice.

FIG. 6 is a sectional view through detail 6-6 of FIG. 3. FIG. 6 illustrates the above-described assembly of the filter **148** and filter assembly **150**. Preferably, as the solvent **130** passes through the filter **148** into the inlet portion **146**, the oils **180** are trapped by the filter **148** and as the oils **180** form droplets **182** along the filter surface **184**, they start to gravitate upward towards the top portion **156** of the reservoir **104**, as shown (this arrangement at least embodies herein wherein such retrieving means comprises filtering means restricting passage of the at least one such undesired material; and at least embodies herein wherein such at least one retriever comprises at least one filter restricting passage of the at least one such undesired material). Preferably, the oils **180** are less dense than the solvent **130**. In such instances when the oils **180** are denser than the solvent **130**,

they preferably gravitate towards the bottom **186** of the reservoir **104**.

Preferably, the reservoir assembly **104** further comprises a magnetic attractor **190**. FIG. 5 is a perspective view of a magnetic attractor **190** of the portable purifying system **100** of FIG. 3. Preferably, the magnetic attractor **190** (at least embodying herein at least one magnetic attractor located within or closely adjacent such at least one reservoir) comprises a magnet **192**, preferably a rare-earth magnet, preferably about three-quarters to one-inch in diameter and preferably about one-inch or larger in length. Preferably, the magnetic attractor **190** is placed within a sealable container **194**, preferably plastic, preferably only slightly larger than the magnet **192**, as shown. Preferably, the magnetic attractor **190** comprises a hanger assembly **196** such that the magnetic attractor **190** may be suspended in the reservoir **104**, as shown. Most preferably the magnetic attractor **190** is suspended within the solvent **130** about two to about four inches above the bottom **186**, as shown (at least embodying herein wherein such at least one magnetic attractor is located near at least one bottom portion of such at least one reservoir). Preferably, the hanger assembly **196** is suspended by cable **198**, preferably suspended from vertical cylinders **142**, as shown. Cable **198** is preferably metal; however, plastic or other

material that will not react with the solvent may suffice.

It is noted that, in light of the teachings herein, those knowledgeable in such art may determine that, under appropriate circumstances with regard to reservoir **140** sizes and expected metallic content of the solvent **130**, other sizes, containers, placement and types of magnets may suffice.

Preferably, the magnetic attractor **190** attracts metals that are washed into reservoir **140** and magnetically draws them towards the bottom **199** of the reservoir **140** or towards the magnet **192**. Preferably, the parts congregate around the sealable container **194**. Preferably, a user may clean the container by simply lifting it out of the reservoir **140**, removing the magnet **192** and wiping off the now de-magnetized container **194**, as shown. Preferably, a non-magnetic material, such as plastic, is used for the container **194** such that this cleaning process is easy. Applicant has determined that utilizing a magnet **192** without the container **194** causes cleaning of the metals from the magnet **192** to be quite time-consuming and messy. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preferences, material availability, etc., other types of magnets and magnet arrangements, etc., such as magnetic materials, electro-magnets, etc., may suffice.

Reference is now made to FIG. 7 and FIG. 8 with continued reference to the above-described Figures. FIG. 7 is an exploded perspective view of the support stand **200** of the portable purifying system **100** of FIG. 1. FIG. 8 is a sectional view through section 8-8 of FIG. 7. Preferably, the reservoir assembly **104** is elevated above the bottom **186** of the parts washer reservoir **108**, as shown (at least embodying herein wherein such at least one first reservoir is removably situate within such at least one second reservoir; and at least embodying herein wherein such first reservoir means is removably situate within such second reservoir means; and at least embodying herein at least one support means for supporting such first reservoir means within such second reservoir means). Preferably, a support stand **106** is utilized for elevating the reservoir assembly **104** (this arrangement at least embodying herein at least one support adapted to support such at least one first reservoir within such at least one second reservoir). Preferably, the reservoir assembly **104** is removable from the support stand **200** to facilitate cleaning of the reservoir assembly **104** and its components, such as filters **148** (cleaning or replacement), magnetic attractor **190**, and cleaning and replacement of the solvent in the reservoir **140**. This arrangement at least embodies herein wherein such at least one reservoir is removably supported by such at least one support.

Preferably, the support stand **106** comprises an annular band **202** having a diameter of about eleven to eleven and one-half inches to fit a 5-gallon bucket as described above (at least embodying herein at least one support, having at least one circumferential band and at least three support legs attached to such at least one circumferential band), as shown. Such 5-gallon buckets are preferably tapered and stackable, as shown. The present embodiment takes advantage of the taper in utilizing the reservoir support stand **106**, as shown. Preferably, the annular band **202** is metallic, preferably galvanized steel. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, shipping weight, etc., other materials, such as plastic, etc., may suffice. Preferably, the support stand **106** also comprises a leg support **204**, preferably three legs **206**, preferably adjustable in height, as shown. Preferably, each leg **206** is attached to the annular band **202** with a rivet **208**, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, materials, etc., other attachment arrangements, may suffice.

Preferably, each leg **206** comprises an upper attachment **210**,

a center section **212** and an optional adjustment portion **214**, as shown. Preferably, the center section **212** is made from one-inch-diameter PVC pipe (at least embodying herein wherein such at least three support legs comprise PVC pipe). Preferably, the upper attachment **210** is a one-inch PVC connector, having a one-inch inner diameter. Preferably, the optional adjustment portion **214** is one and one-quarter inch PVC pipe having a one-inch inner diameter. Preferably, the upper attachment **210**, a center section **212** and an optional adjustment portion **214** slidably fit into each other, as shown. The upper attachment **210** and center section **212** may be glued together, if desired, under appropriate circumstances. When an adjustment portion **214** is used, the center section **212** is preferably drilled to provide a plurality of apertures **216** for use in adjusting the height of the legs **206**, as shown (at least embodying herein at least one height adjuster structured and arranged to adjust the height of such at least one support). Preferably, a bolt and nut assembly **218** is placed through an aperture **216** and through an aperture **220** in leg **206** and connected to hold the leg in a desired position, as shown. In light of the teachings herein, those knowledgeable in such art may determine that, under appropriate circumstances, with regard to the support of the reservoir assembly **104**, other arrangements may suffice.

FIG. 11 shows a perspective view of the support stand of the portable purifying system according to another preferred embodiment of the present invention. FIG. 12 shows a front view of a first panel of the support stand of FIG. 11. FIG. 13 shows a front view of a second panel of the support stand of FIG. 11. In another preferred embodiment of the support stand **106**, support stand **240** is a knockdown, non-adjustable support for reservoir **104**, as shown. Preferably, support stand **240** comprises a first panel **242** and a second panel **244**, as shown. Preferably, both the first panel **242** and second panel **244** comprise rectangular-shaped perimeter **248**, preferably about fourteen inches wide by about twenty inches in height, having a substantially U-shaped cutout **250**, as shown. Preferably, the U-shaped cutout **250** is about eleven inches in depth and about eleven and one-half inches in width to accommodate a 5-gallon bucket, as shown. Upon reading the teachings of this specification, those with ordinary skill in the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, reservoir size, etc., other dimensions for the U-shaped cutout **250** may suffice. Preferably, both the first panel **242** and second panel **244** comprise a chemically resistant material such as, for example, polyacrylate (for example, Lucite®), preferably about three-eighths inch in thickness. Upon reading the teachings of this specification, those with ordinary skill in

the art will now understand that, under appropriate circumstances, considering such issues as economics, user preference, material availability, durability, machining costs, etc., other materials, such as HDPE, PVC, etc., may suffice.

Preferably, the first panel **242** and second panel **244** comprise coupling slots **252** and **254** to provide a means for coupling the preferably flat panels together, as shown. Preferably, slot **252** is situate about the center **256** of the bottom portion **258** of the first panel **242**, as shown. Preferably, the slot **252** is slightly wider than the width of the material of the second panel **244**. Preferably, slot **254** is situate about the center **260** of the top portion **262** of the second panel **244**, as shown. Preferably, the slot **254** is slightly wider than the width of the material of the first panel **242**. Preferably, each slot **242** and **244** are about one half the distance of the base portion **266**, preferably about four and one-half inches in length, such that when the first panel **242** is placed over the second panel **244** in a perpendicular arrangement, as shown, the slot **252** slides through the slot **254** and each respective slot **252** and **254** tightly fits to the respective remaining base portion **266**, as shown. In such manner, the first panel **242** and second panel **244** complete a support stand **240** having a substantially flat standing bottom and structured and arranged to hold a 5-gallon reservoir **104**, as

shown.

Preferably, an identifying plate **270** is permanently attached to each reservoir **104**, preferably along the top portion, as shown. Preferably, the identifying plate **270** comprises a number or bar code to track the individual reservoir for usage and performance. In addition, the identifying plate **270** may comprises patent number or patent pending indicia.

Reference is now made to all of the above Figures with particular reference to FIG. 3 to illustrate a preferred operation of the portable purifying system **100**. Preferably, the reservoir **140** is placed into the reservoir **108**, as shown (at least embodying herein means for providing a smaller reservoir within a larger reservoir). Preferably, the reservoir support stand **106** is adjusted in height such that the reservoir assembly **104** will be under the drain **118** with about two to about six inches of clearance between the top edge **158** of the reservoir **140** and the bottom **222** of the drain **118**, as shown. Under appropriate circumstances, other clearance arrangements may suffice. For example, the reservoir may also be removably attached to the washbasin (at least embodying herein wherein such first reservoir means is removably attached to at least one wash basin). Most preferably, the outlet openings **160** are higher than the level of solvent **130** in the reservoir **108** of the parts washer **102**, as

shown. Preferably, the reservoir **140** is next placed into the reservoir support stand **106**, as shown. Preferably, the parts washer **102** is already filled with solvent, preferably to a height as recommended by the parts washer manufacturer, however less than a height that would hinder the portable purifying system **100** from being effective (meaning the height of the solvent in the reservoir **108** must preferably be lower than the outlet openings **160** as described above).

Preferably, the parts washer pump **110** is activated and the solvent **130** begins to re-circulate. Preferably, a part **132** is placed in wash basin **114** (at least embodying herein at least one wash basin) and the nozzle end **126** is directed towards the part **132**, as shown. Preferably, as the solvent **130** washes over the part **132**, a mixture **230** comprising the solvent **130** (a desired portion of the mixture), oily residue **224**, metals **226**, sludge **228** and other loose debris (together comprising an undesired portion of the mixture) are washed down the drain **118** and into the reservoir **140** of the portable purifying system **100**, as shown (at least embodying herein means for using re-circulating solvent from the larger reservoir, washing oily parts in such manner that oily residue from the washed parts is deposited in the smaller reservoir). Preferably, as the solution **230** enters the reservoir **140**, the differing densities and materials of the solution **230**

separate, as shown. This arrangement at least embodies herein wherein such first configuration of such at least one reservoir comprises at least one gravity separator to use gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired material. This arrangement also at least embodies herein means for using density differences to separate by gravity action cleaner portions from dirtier portions.

Preferably, the heavier metals **226**, including magnetic and non-magnetic metals, move towards the bottom **199** of the reservoir **140**, preferably by gravity means, which naturally separate the materials (the above described arrangement at least embodies herein gravity means for using gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired material; and at least embodies herein at least one gravity separator to use gravity to separate differing densities among the at least one first ratio of the at least one desired material and the at least one second ratio of the at least one undesired material), as well as through the use of the magnetic attractor **190**. Preferably, the magnetic attractor **190** assists in attracting such magnetic material towards the bottom **199** and towards the magnetic attractor **190**, as shown.

Preferably, the heavier sludge **228** also moves toward the bottom **199**, as shown.

The oily residue **224** moves toward the top portion **156** such that the oily residue is suspended above the majority of the solvent **130**, as shown (the above arrangement at least embodies herein means within the smaller reservoir, for separating cleaner portions of solvent from dirtier portions of solvent). Preferably, the majority of the solvent **130** resides in the middle portion **232** of the reservoir **140**. Under appropriate circumstances, other arrangements may suffice. For example, if a lighter or denser solvent is used the majority of the solvent (or other desired material) might reside in other portions.

Preferably, vertical cylinders **142** are placed in about the middle of the cleanest portions of the solvent **130**, as shown. Preferably, the cleaner solvent **130** is further filtered by the filter **148** as the solvent **130** moves upward through the vertical cylinders **142** (such movement of the fluid in the reservoir and upward through the vertical cylinders, as the fluid level in the reservoir rises, occurring by well-known fluid-flow dynamics which will not be further detailed herein) and outward through the outlet opening **160**, as shown (at least embodying herein means for moving the cleaner portions of solvent into the larger reservoir).

Preferably, at regular intervals (based on usage) the reservoir **140** is periodically emptied of all contents and cleaned (at least embodying herein means for periodically emptying and cleaning the smaller reservoir). Preferably, the filters **148** are cleaned as they get soiled and the magnetic attractor **190** is cleaned as metals **226** surround it. Preferably, the amount of solvent **130** added to the portable purifying system **100** is only about as much as is removed during such cleaning.

It is noted that the above-described steps at least embody herein a portable purifying system comprising, in combination, the steps of: providing a smaller reservoir within a larger reservoir; using re-circulating solvent from the larger reservoir, washing oily parts in such manner that oily residue from the washed parts is deposited in the smaller reservoir; within the smaller reservoir, separating cleaner portions of solvent from dirtier portions of solvent; moving the cleaner portions of solvent into the larger reservoir; and periodically emptying and cleaning the smaller reservoir; and using density differences to separate by gravity action cleaner portions from dirtier portions.

Although applicant has described applicant's preferred embodiments of this invention, it will be understood that the broadest scope of this invention includes such modifications as diverse shapes and sizes and materials. Such scope is limited

only by the below claims as read in connection with the above specification. Further, many other advantages of applicant's invention will be apparent to those skilled in the art from the above descriptions and the below claims.